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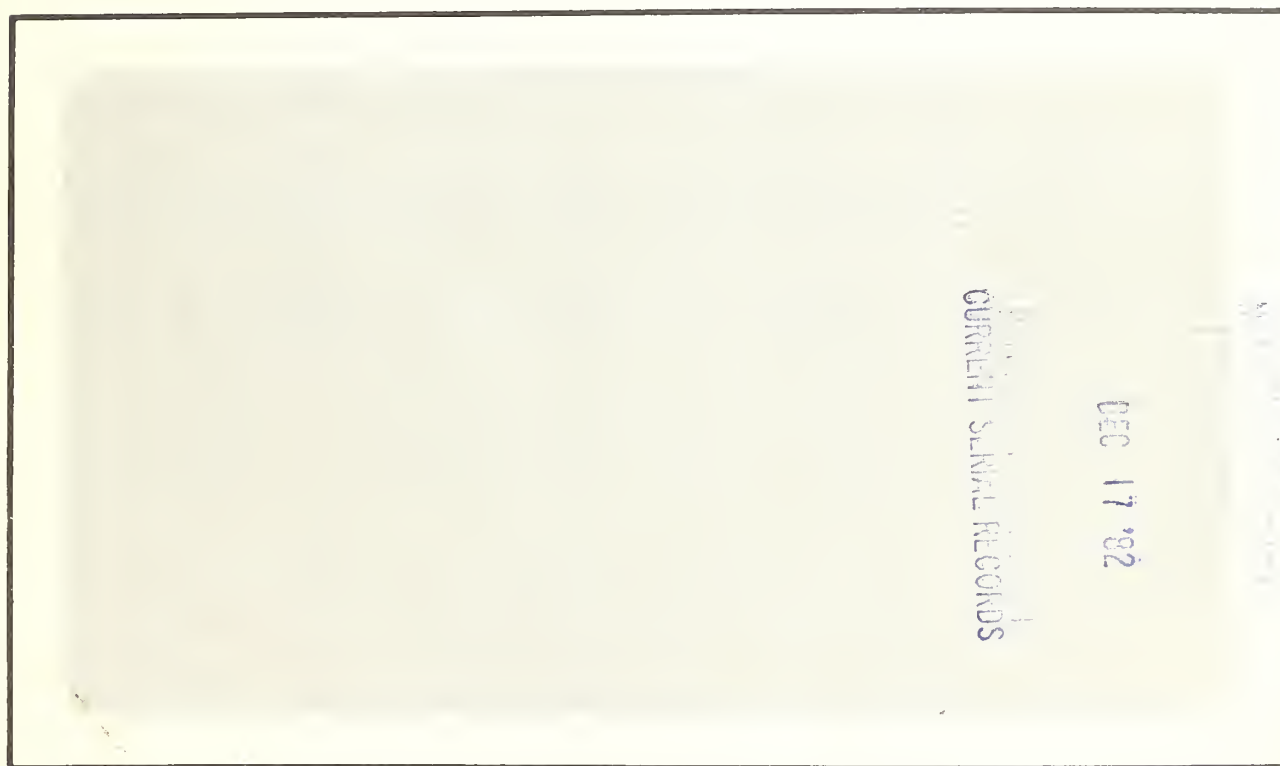
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Bacillus thuringiensis Cultures
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Bacillus thuringiensis Cultures Available From the U.S. Department of Agriculture

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ABSTRACT

Almost 800 isolates of *Bacillus thuringiensis* (Berliner) are listed. Serovar, crystal type, contributor, and historical information are given. The isolates are available to researchers on request. Index terms: *Bacillus thuringiensis* (Berliner), bacterial culture collections, catalogs, insect control.

INTRODUCTION

This catalog lists isolates of *Bacillus thuringiensis* (Berliner) that have been received in the Brownsville, Tex., laboratories of the Agricultural Research Service, U.S. Department of Agriculture. The collection has been assembled to offer scientists a wide variety of isolates for their studies on insect control. Different isolates of *B. thuringiensis* kill different insects, and formulations of at least three isolates are now or will be offered for sale in the United States. A continuing search for new isolates with improved activity against specific pest insects offers considerable hope for broadening the scope of formulations of *B. thuringiensis*.

B. thuringiensis is a spore-forming, rod-shaped bacterium, 1.0 to 1.2 μm wide and 3 to 5 μm long. It is closely related to *Bacillus cereus* (Frankland and Frankland), but it differs by having a distinctive crystal in mature, sporulated, normal cells. The presence of this crystal is so distinctive that the serovars, or varieties, of *B. thuringiensis* are frequently referred to as the crystalliferous bacteria.

B. thuringiensis has long been known to kill insects. It was first isolated from diseased silkworms, the larvae of the moth *Bombyx mori* (Linnaeus), in 1901 by Ishiwata in Japan. It was next isolated from diseased larvae of the Mediterranean flour moth, *Anagasta kuehniella* (Zeller), in 1911 by Berliner in Germany. It was subsequently found to kill larvae of many species of lepidopterous insects. This led to suggestions that *B. thuringiensis* could be used to protect crops and forests from these types of insect pests.

At first, it was presumed that *B. thuringiensis* itself was infectious, and the goal of scientists investigating its value in pest control was to apply

as many spores per acre as possible. But results were erratic. It has since been found that the primary action of *B. thuringiensis* against susceptible insects is through a high-molecular-weight, proteinaceous toxin that it produces. This toxin, named δ -endotoxin by Heimpel in 1967, is associated with, or is part of, the crystal in sporulated cells. Some isolates of *B. thuringiensis* also produce other toxins, including α -exotoxin, β -exotoxin, and a "louse factor."

In 1962, de Barjac and Bonnefoi proposed that *B. thuringiensis* be classified into varieties according to the antigenic reactions of the flagellae (H-antigen) possessed by the young, motile cells of this species. Their system, supplemented in some cases by specific biochemical tests, is universally used today. Originally, de Barjac and Bonnefoi identified isolates by varietal name only. Now, isolates are preferably called "serovars" and are identified by the H-antigen and varietal designation. Thus, *B. thuringiensis* var. *kurstaki* would be *B. thuringiensis* serovar 3a3b, *kurstaki*. The dual system is used in this catalog. (See the first entry.)

As stated earlier, the δ -endotoxin produced by *B. thuringiensis* is associated with the crystal present in sporulated cells of this *Bacillus*. In 1977, Krywienczyk reported that these crystals could be differentiated serologically and proposed that serotyping of the crystal could be a useful tool in the identification of *B. thuringiensis* isolates. Later, Krywienczyk et al. (1978, 1981) showed that there was a correlation between crystal type and the spectrum of insecticidal activity of *B. thuringiensis* isolates. Crystal type has been incorporated as one characteristic in this catalog.

Dulmage culture No.—This column lists the accession number for all isolates of *B. thuringiensis*, and cultures are filed under these numbers. They should be used in requests for cultures.

Serovar.—As explained earlier, cultures are classified by H-antigen, given as a number. Numbering follows de Barjac's system, and her decisions have been accepted. After the H-number, the varietal name is listed. In two cases, the H-antigen designation is further subdivided. H-4a4b is divided by esterase patterns into var. *sotto* and var. *dendrolimus*, and H-6 is divided by biochemical tests into var. *subtoxicus* and var. *entomocidus*. In a third case, var. *wuhanensis* has no flagellae and thus cannot be serotyped. If the identification of a serovar is uncertain, all the possibilities are listed. The serovars are indexed at the end of the publication.

Crystal type.—As explained earlier, crystals can be differentiated serologically. Sometimes, isolates of the same serovar will have different crystals; sometimes the same crystal type will appear in different serovars. In some cases, Krywienzyk has identified more than one crystal in an isolate; when more than one crystal type is listed for a culture number, the word "and" is assumed. The crystal types are indexed at the end of the publication.

Contributors.—This column lists the name of the scientist who sent the culture, and, if available, his or her culture number for the isolate. The full name and address of the contributor are given at the end of the publication.

Remarks.—This column presents in abbreviated form any pertinent data we may have on the history of the isolate: from what it was isolated, how it was derived, or, if the contributor was not the scientist who originally isolated the culture, who did isolate it.

ORDERING INFORMATION

Up to 10 isolates may be requested at one time. Alternatively, representative isolates of each serovar may be requested, the selection to be the curator's. **Complete sets of all isolates cannot be supplied.** No culture will be released without the permission of the contributor, but most of the isolates in this catalog are available without any conditions. Order by Dulmage culture number (HD-) and send requests to the curator:

Gail Donaldson
Cotton Insects Research Unit
P.O. Box 1033
Brownsville, Tex. 78520, U.S.A.

SELECTED ISOLATES REPRESENTATIVE OF SEROVARS IN THE COLLECTION

These isolates have been used in the preparation of antisera for flagellar serotyping. HD-numbers above 766 are not cataloged in this edition.

HD-Number	Serovar	HD-Number	Serovar
2	1, <i>thuringiensis</i>	537	9, <i>tolworthi</i>
3	2, <i>finitimus</i>	146	10, <i>darmstadiensis</i>
4	3a, <i>alesti</i>	201	11a11b, <i>toumanoffii</i>
73	3a3b, <i>kurstaki</i>	541	11a11c, <i>kyushuensis</i>
770	4a4b, <i>sotto</i>	542	12, <i>thompsoni</i>
7	4a4b, <i>dendrolimus</i>	395	13, <i>pakistani</i>
5	4a4c, <i>kenyae</i>	567	14, <i>israelensis</i>
29	5a5b, <i>galleriae</i>	521	15, <i>indiana</i>
224	5a5c, <i>canadensis</i>	(¹)	16, <i>dakota</i>
9	6, <i>entomocidus</i>	866	17, <i>tohokuensis</i>
109	6, <i>subtoxicus</i>	867	18, <i>kumanotoensis</i>
11	7, <i>aizawai</i>	868	19, <i>tochigiensis</i>
12	8a8b, <i>morrisoni</i>	847	20, <i>colmeri</i>
501	8a8c, <i>ostriniae</i>	525	<i>wuhanensis</i>

¹Not presently available in collection.

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BACILLUS THURINGIENSIS CULTURES MAINTAINED AT THE USDA LABORATORIES, BROWNSVILLE, TEX.

Dulmage culture No. (HD-)	Serovar	Crystal type	Contributors and their culture Nos.	Remarks
1	3a3b, kurstaki	k-1	Dulmage	Isolated from diseased <i>Pectinophora gossypiella</i> in mass-rearing program at Brownsville, Tex.
2	1, thuringiensis	thu	de Barjac	
3	2, finitimus	NI	de Barjac	
4	3a, alesti	ale	de Barjac	
5	4a4c, kenya	ken	de Barjac	
6	4a4b, sotto	NI	de Barjac	
7	4a4b, dendrolimus	den	de Barjac	
8	5a5b, galleriae	gal	de Barjac	
9	6, entomocidus	NI	de Barjac	
10	6, subtoxicus	sub	de Barjac	
11	7, aizawai	aiz	de Barjac	
12	8a8b, morrisoni	NI	de Barjac	
13	9, tolworthi	NI	de Barjac	
14	1, thuringiensis	k-1	Lysenko CCEB 457	
15	1, thuringiensis	k-1	Lysenko CCEB 461	
16	3a, alesti	NI	Lysenko CCEB 463	
17	1, thuringiensis	k-1	Lysenko CCEB 459	
18	1, thuringiensis	NC	Lysenko CCEB 458	Isolated from <i>Bombyx mori</i> . Originally described as <i>Bacillus entomocidus</i> var. <i>entomocidus</i> isolated from <i>Aphemia gularis</i> by E. Steinhaus, U.S.A. (57-1-1).
19	2, finitimus	NI	Lysenko CCEB 460	Originally described as <i>Bacillus entomocidus</i> var. <i>subtoxicus</i> isolated from <i>Plodia interpunctella</i> by E. Steinhaus, U.S.A. (58-1-1).
20	1, thuringiensis	thu	Lysenko CCEB 056	Originally described as <i>Bacillus finitimus</i> isolated from <i>Malacosoma disstria</i> by A. Heimpel, U.S.A. (Ma-d-7000).
21	3a3b, kurstaki	k-73	Lysenko CCEB 057	Originally described as <i>Bacillus finitimus</i> by Z. Klement, Hungary. No crystals or parasporal bodies.
22	1, thuringiensis	k-1 thu	Lysenko CCEB 058	Originally described as <i>Bacillus finitimus</i> isolated from <i>Plodia interpunctella</i> by J. Weiser, Czechoslovakia (strain CvW).
23	1, thuringiensis	NC	Lysenko CCEB 059	Originally described as <i>Bacillus finitimus</i> by J. Van-kova, U.S.S.R. (mutant of CCEB 058; no crystals).

"Crystal type" column: NI, not identified; NC, no crystals; AC, atypical crystal type.

BACILLUS THURINGIENSIS CULTURES MAINTAINED AT THE USDA LABORATORIES, BROWNSVILLE, TEX.

Dulmage culture No. (HD-)	Serovar	Crystal type	Contributors and their culture Nos.	Remarks
24	1, thuringiensis	thu	Lysenko CCEB 206	Originally described as Bacillus finitimus by L. Vasiljevic, Yugoslavia (CCEB 457).
25	1, thuringiensis	thu	Lysenko CCEB 311	Originally described as Bacillus finitimus by C. Hannay, Canada (CCEB 457).
26	1, thuringiensis	thu	Lysenko CCEB 462	Originally described as Bacillus finitimus by C. Toumanoff, France.
27	1, thuringiensis	thu	Lysenko CCEB 563	Originally described as Bacillus finitimus isolated from Antheraea pernyi by O. Schvetsova, U.S.S.R. (Ds-2).
28	1, thuringiensis	thu	Lysenko CCEB 564	Originally described as Bacillus finitimus isolated from Antheraea pernyi by O. Schvetsova, U.S.S.R. (Ds-3).
29	5a5b, galleriae	gal	Lysenko CCEB 565	Originally described as Bacillus finitimus isolated from Dendrolimus sibericus by O. Schvetsova, U.S.S.R. (Ss-T).
30	5a5c, canadensis	k-1 gal	Lysenko CCEB 566	Originally described as Bacillus finitimus isolated from Notodonta ancera by O. Schvetsova, U.S.S.R. (Dch-T). Crystals are rare.
31	3a3b, kurstaki	NC	Lysenko CCEB 389	Originally described as Bacillus finitimus (Bacillus thuringiensis var. ephestiae) by E. Steinhaus, U.S.A. (0-18-1; no crystals).
32	1, thuringiensis	NI	Lysenko CCEB 390	Originally described as Bacillus finitimus (Bacillus ephestiae, strain 2) by E. Steinhaus, U.S.A. (0-18-2).
33	4a4b, dendrolimus	NI	Lysenko CCEB 207	Originally described as Bacillus finitimus (Bacillus sotto) by L. Vasiljevic, Yugoslavia. Atypical round inclusions.
34	4a4b, dendrolimus	NI	Lysenko CCEB 306	Originally described as Bacillus dendrolimus isolated from Dendrolimus sibericus by E. Talalaev, U.S.S.R. (strain A).
35	4a4b, dendrolimus	den	Lysenko CCEB 307	Originally described as Bacillus dendrolimus isolated from Dendrolimus sibericus by E. Talalaev, U.S.S.R. (strain B).
36	4a4b, dendrolimus	NI	Lysenko CCEB 393	Originally described as Bacillus dendrolimus (Bacillus bombycis) by E. Steinhaus, U.S.A. (0-31-1; no crystals---parasporal bodies only).

"Crystal type" column: NI, not identified; NC, no crystals; AC, atypical crystal type.

BACILLUS THURINGIENSIS CULTURES MAINTAINED AT THE USDA LABORATORIES, BROWNSVILLE, TEX.

Duplicate culture No. (HD-)	Serovar	Crystal type	Contributors and their culture Nos.	Remarks
37	4a4b, dendrolimus	sot	Lysenko CCEB 394	Originally described as <i>Bacillus dendrolimus</i> (<i>Bacillus bombycis</i>) by E. Steinhaus, U.S.A. (0-31-2).
38	Not identified	NI	Fast 280-21	Contributor received culture from O. Lysenko, Czechoslovakia. Culture is a single-cell isolate of HD-280.
39	1, thuringiensis	k-1	Lysenko CCEB 209	Originally described as <i>Bacillus dendrolimus</i> (<i>Bacillus cereus</i> P3) by L. Vasiljevic, Yugoslavia (no crystals).
40	3a, alesti	NI	Lysenko CCEB 558	Originally described as <i>Bacillus dendrolimus</i> (<i>Bacillus</i> sp. strain anduze) by J. Weiser, Czechoslovakia.
41	1, thuringiensis	NC	Lysenko CCEB 555	Originally described as <i>Bacillus dendrolimus</i> (<i>Bacillus gelechia</i>) by J. Weiser, Czechoslovakia (no crystals).
42	1, thuringiensis	NC	Lysenko CCEB 556	Originally described as <i>Bacillus dendrolimus</i> (<i>Bacterium cazaubon</i> , No. 1) by J. Weiser, Czechoslovakia (no crystals).
43	Autoagglutinates	NC	Lysenko CCEB 557	Originally described as <i>Bacillus dendrolimus</i> (<i>Bacterium cazaubon</i> , No. 2) by J. Weiser, Czechoslovakia (no crystals).
44	3a, alesti	NC	Lysenko CCEB 204	Originally described as <i>Bacillus dendrolimus</i> by L. Vasiljevic, Yugoslavia (no crystals).
45	3a, alesti	NI	Lysenko CCEB 600	Originally described as <i>Bacillus thuringiensis</i> var. euxoae isolated from <i>Agrotis segetum</i> by A. Krieg, West Germany.
46	1, thuringiensis	NC	Lysenko CCEB 601	Originally described as <i>Bacillus thuringiensis</i> var. euxoae (var. <i>thuringiensis</i> strain <i>galleriae</i>) isolated from <i>Galleria mellonella</i> by A. Krieg, West Germany.
47	4a4b, dendrolimus	NI	Lysenko CCEB 602	Originally described as <i>Bacillus thuringiensis</i> var. euxoae isolated from <i>Stilpnotia salicis</i> by O. Lysenko, Czechoslovakia (99-1).
48	4a4b, dendrolimus	sot	Lysenko CCEB 603	Originally described as <i>Bacillus thuringiensis</i> var. euxoae isolated from <i>Stilpnotia salicis</i> by O. Lysenko, Czechoslovakia (99-6).
49	Not identified	NI	Fast 280-22	Contributor received culture from O. Lysenko, Czechoslovakia. Culture is a single-cell isolate of HD-280.

"Crystal type" column: NI, not identified; NC, no crystals; AC, atypical crystal type.

BACILLUS THURINGIENSIS CULTURES MAINTAINED AT THE USDA LABORATORIES, BROWNSVILLE, TEX.

Dulmage culture No. (HD-)	Serovar	Crystal type	Contributors and their culture Nos.	Remarks
50	Autoagglutinates	NI	Lysenko CCEB 605	Originally described as <i>Bacillus thuringiensis</i> var. <i>euxoa</i> by O. Lysenko, Czechoslovakia (107-3-1). No crystals, but parasporal bodies formed. Now observed to have beautiful crystals.
51	Not identified	NI	Fast 280-111	Contributor received culture from O. Lysenko, Czechoslovakia. Culture is a single-cell isolate of HD-280.
52	7, aizawai	aiz	Van der Laan & Wassink	Isolated from <i>Plodia interpunctella</i> found on dried onions from Hungary.
53	1, thuringiensis	thu	Van der Laan & Wassink	Isolated from <i>Tribolium castaneum</i> on oil palm pits from Africa.
54	1, thuringiensis	thu	Van der Laan & Wassink	Isolated from <i>Anagasta kuehniella</i> in insectary in contributors' laboratory.
55	1, thuringiensis	thu	Cosenza	
56	1, thuringiensis	NC	Cosenza 4E	
57	1, thuringiensis	thu	Cosenza 5	
58	1, thuringiensis	thu	Cosenza 1A	
59	1, thuringiensis	thu	Cosenza 34	
60	1, thuringiensis	thu	Tanada 0-3-30	Contributor received culture from E. Steinhaus, U.S.A. (0-3-30).
61	3a, aesti	NI	Tanada 0-24-3	Contributor received culture from E. Steinhaus, U.S.A. (0-24-3).
62	4a4c, kenya	ken	Tanada 59-1-1	Contributor received culture from E. Steinhaus, U.S.A. (59-1-1).
63	4a4c, kenya	ken	Tanada 92-1-1	Contributor received culture from E. Steinhaus, U.S.A. (92-1-1).
64	4a4c, kenya	AC	Tanada 92-2-1	Contributor received culture from E. Steinhaus, U.S.A. (92-2-1).
65	1, thuringiensis	thu	Tanada 93-1-1	Contributor received culture from E. Steinhaus, U.S.A. (93-1-1).
66	5a5b, galleriae	NI	Tanada 56-129	Isolate of a commercial preparation from Bioferm, U.S.A.
67	7, aizawai	NI	Hunter	Isolated from <i>Paramyeltsis transitella</i> .
68	7, aizawai	aiz	Hunter	Isolated from <i>Paramyeltsis transitella</i> .
69	3a, aesti	NC	de Barjac 1	

"Crystal type" column: NI, not identified; NC, no crystals; AC, atypical crystal type.

BACILLUS THURINGIENSIS CULTURES MAINTAINED AT THE USDA LABORATORIES, BROWNSVILLE, TEX.

Dulmage culture No. (HD-)	Serovar	Crystal type	Contributors and their culture Nos.	Remarks
70	3a, alesti	ale	de Barjac 3	Contributor received culture from O. Lyzenko, Czechoslovakia. Culture is a single-cell isolate of HD-280.
71	3a, alesti	ale	de Barjac 2	
72	3a, alesti	ale	de Barjac 4	
73	3a3b, kurstaki	k-73	de Barjac 5	
74	3a3b, kurstaki	k-73	de Barjac 6	
75	3a, alesti	ale	de Barjac 11	
76	3a, alesti	NI	de Barjac 12	
77	Not identified	NI	Fast 280-12	
78	3a3b, kurstaki	k-73	de Barjac 14	
79	3a, alesti	ale	de Barjac 15	
80	3a, alesti	NI	de Barjac 16	Beautiful crystals. Beautiful crystals.
81	3a, alesti	ale	de Barjac 18	
82	3a, alesti	ale	de Barjac 19	
83	3a, alesti	ale	de Barjac 20	
84	3a, alesti	k-73	de Barjac 21	
85	3a3b, kurstaki	k-73	de Barjac 22	Isolated from diseased Pectinophora gossypiella. Isolated from diseased Trichoplusia ni. Isolated from diseased Trichoplusia ni. Contributor received culture from A. Heimpel, U.S.A. (2EW-1). Contributor received culture from A. Heimpel, U.S.A. (2-DD749). Contributor received culture from A. Heimpel, U.S.A. (2-Smirnoff). Contributor received culture from A. Heimpel, U.S.A. (2-LBG-B4058C). Contributor received culture from A. Heimpel, U.S.A. (2-Epe-2000a). Contributor received culture from A. Heimpel, U.S.A. (2-Va). Contributor received culture from A. Heimpel, U.S.A. (2-996).
86	3a, alesti	ale	de Barjac 24	
87	3a3b, kurstaki	k-1	Dulmage	
88	3a3b, kurstaki	k-1	Correa	
89	3a3b, kurstaki	k-1	Correa	
90	1, thuringiensis	thu	Dubois 25	
91	1, thuringiensis	thu	Dubois 27	
92	1, thuringiensis	thu	Dubois 31	
93	1, thuringiensis	thu	Dubois 33	
94	1, thuringiensis	thu	Dubois 67	
95	1, thuringiensis	k-1	Dubois 75	
96	1, thuringiensis	thu	Dubois 76	

"Crystal type" column: NI, not identified; NC, no crystals; AC, atypical crystal type.

BACILLUS THURINGIENSIS CULTURES MAINTAINED AT THE USDA LABORATORIES, BROWNSVILLE, TEX.

Duplicate culture No. (HD-)	Serovar	Crystal type	Contributors and their culture Nos.	Remarks
97	1, thuringiensis	thu	Dubois 85	Contributor received culture from B. Cosenza, U.S.A. (1A).
98	1, thuringiensis	thu	Dubois 87	Contributor received culture from B. Cosenza, U.S.A. (3H).
99	2, finitimus	NI	Dubois 93	Contributor received culture from A. Heimpel, U.S.A. (2-Mad-7000). Crystals are attached to the spores.
100	3a, alesti	NI	Dubois 95	Contributor received culture from A. Heimpel, U.S.A. (2). Crystals are rare.
101	3a, alesti	NC	Dubois 105	Originally described as Bacillus thuringiensis var. euxoae by A. Heimpel, U.S.A. (2).
102	3a3b, kurstaki	NI	Dubois 107	Contributor received culture from A. Heimpel, U.S.A. (2-K-18). Crystals are rare.
103	1, thuringiensis	k-1	Dubois 108	Contributor received culture from A. Heimpel, U.S.A. (K-17).
104	3a, alesti	ale	Dubois 109	Originally described as Bacillus thuringiensis var. anduze by A. Heimpel, U.S.A. (2).
105	Not identified	NI	Fast 280-121	Contributor received culture from O. Lysenko, Czechoslovakia. Culture is a single-cell isolate of HD-280.
106	4a4b, dendrolimus	den thu	Dubois 124 (119)	Contributor received culture from A. Heimpel, U.S.A. (2).
107	5a5b, galleriae	gal	Dubois 133	Contributor received culture from A. Heimpel, U.S.A. (2-G-1).
108	5a5b, galleriae	NI	Dubois 136	Contributor received culture from A. Heimpel, U.S.A. (2-Pi-L 106).
109	6, subtoxicus	gal	Dubois 141	Contributor received culture from A. Heimpel, U.S.A. (2-1124).
110	6, entomocidus	ent	Dubois 143	Contributor received culture from A. Heimpel, U.S.A. (2-1328).
111	7, aizawai	aiz	Dubois 146	Contributor received culture from A. Heimpel, U.S.A. (2-T63-14).
112	7, aizawai	aiz	Dubois 147	Contributor received culture from A. Heimpel, U.S.A. (2-DD-742).
113	7, aizawai	aiz	Dubois 149	Contributor received culture from A. Heimpel, U.S.A. (2-58-3-1).

"Crystal type" column: NI, not identified; NC, no crystals; AC, atypical crystal type.

BACILLUS THURINGIENSIS CULTURES MAINTAINED AT THE USDA LABORATORIES, BROWNSVILLE, TEX.

Dulmage culture No. (HD-)	Serovar	Crystal type	Contributors and their culture Nos.	Remarks
114	7, aizawai	aiz	Dubois 151 (144)	Contributor received culture from A. Heimpel, U.S.A. (2-HA-3).
115	7, aizawai	aiz	Dubois 152 (145)	Contributor received culture from A. Heimpel, U.S.A. (2-IH-A).
116	8a8b, morrisoni	NI	Dubois 157 (156)	Contributor received culture from A. Heimpel, U.S.A. (2-G-2).
117	1, thuringiensis	k-1	Dubois	Contributor received culture from A. Heimpel, U.S.A. (2-Epe-2000). Crystals appear atypical.
118	Autoagglutinates	NI	Dubois	Contributor received culture from A. Heimpel, U.S.A. (2-DD-768).
119	3a3b, kurstaki	k-1	Burges HDB-1	Originally described as 12-thompsoni isolated from Ephestia cautella. Beautiful crystals.
120	1, thuringiensis	k-1	Burges HDB-2	Isolated from Ephestia elutella. Crystals appear atypical.
121	9, tolworthi	tol	Burges HDB-3	Isolated from Plodia interpunctella.
122	7, aizawai	aiz	Burges HDB-4	Isolated from Plodia interpunctella.
123	4a4c, kenyae	ken	Burges HDB-6	Isolated from Ephestia cautella.
124	9, tolworthi	tol	Burges HDB-7	Originally described as 4a4c, kenyae isolated from Ephestia cautella. Crystals appear atypical.
125	9, tolworthi	tol	Burges HDB-8	Isolated from Ephestia cautella. Crystals appear atypical.
126	7, aizawai	NI	Burges HDB-9	Isolated from Plodia interpunctella in Australia.
127	7, aizawai	aiz	Burges HDB-10	Isolated from Plodia interpunctella.
128	7, aizawai	aiz	Burges HDB-12	Isolated from Plodia interpunctella.
129	5a5b, gallieriae	gal	Burges HDB-15	Isolated from Galleria mellonella.
130	7, aizawai	NI	Burges HDB-17	Isolated from Plodia interpunctella.
131	7, aizawai	aiz	Burges HDB-18	Isolated from Anagasta kuehniella.
132	7, aizawai	aiz	Burges HDB-19	Isolated from Plodia interpunctella.
133	7, aizawai	aiz	Burges HDB-20	Isolated from Plodia interpunctella.
134	7, aizawai	aiz	Burges HDB-21	Isolated from Plodia interpunctella.
135	7, aizawai	NI	Burges HDB-22	Isolated from Ephestia cautella.
136	4a4c, kenyae	ken	Burges HDB-23	Isolated from Corcyra cephalonica.
137	7, aizawai	aiz	Burges HDB-24	Isolated from Plodia interpunctella. Beautiful crystals.
138	1, thuringiensis	thu	Krieg I-11	

"Crystal type" column: NI, not identified; NC, no crystals; AC, atypical crystal type.

BACILLUS THURINGIENSIS CULTURES MAINTAINED AT THE USDA LABORATORIES, BROWNSVILLE, TEX.

Dulmage culture No. (HD-)	Serovar	Crystal type	Contributors and their culture Nos.	Remarks
139	1, thuringiensis	thu	Krieg I-12	Contributor received culture from O. Lyenko, Czechoslovakia. Culture is a single-cell isolate of HD-280.
140	1, thuringiensis	NC	Krieg I-13	
141	1, thuringiensis	thu	Krieg I/14/k	
142	7, aizawai	NI	Krieg I/15	
143	7, aizawai	aiz	Krieg VII/75	
144	7, aizawai	aiz	Krieg VII/76	
145	3a, alesti	NI	Krieg III/36	
146	10, darmstadiensis	dar	Krieg 10/103	
147	10, darmstadiensis	dar	Krieg 10/102	
148	Not identified	NI	Fast 280-122	
149	5a5b, galleriae	gal	de Barjac	Laboratory isolate derived from HD-8 at Brownsville, Tex.
150	5a5b, galleriae	gal	de Barjac	Laboratory isolate derived from HD-8 at Brownsville, Tex.
151	5a5b, galleriae	gal	de Barjac	Laboratory isolate derived from HD-8 at Brownsville, Tex.
152	5a5b, galleriae	gal	de Barjac	Laboratory isolate derived from HD-8 at Brownsville, Tex.
153	5a5b, galleriae	gal	de Barjac	Laboratory isolate derived from HD-8 at Brownsville, Tex.
154	5a5b, galleriae	gal	de Barjac	Laboratory isolate derived from HD-8 at Brownsville, Tex.
155	5a5b, galleriae	gal	de Barjac	Laboratory isolate derived from HD-8 at Brownsville, Tex.
156	5a5b, galleriae	gal	de Barjac	Laboratory isolate derived from HD-8 at Brownsville, Tex.
157	5a5b, galleriae	gal	de Barjac	Laboratory isolate derived from HD-8 at Brownsville, Tex.
158	5a5b, galleriae	gal	de Barjac	Laboratory isolate derived from HD-8 at Brownsville, Tex.
159	5a5b, galleriae	gal	de Barjac	Laboratory isolate derived from HD-8 at Brownsville, Tex.
160	5a5b, galleriae	gal	de Barjac	Laboratory isolate derived from HD-8 at Brownsville, Tex.

"Crystal type" column: NI, not identified; NC, no crystals; AC, atypical crystal type.

BACILLUS THURINGIENSIS CULTURES MAINTAINED AT THE USDA LABORATORIES, BROWNSVILLE, TEX.

Dulmage culture No. (HD-)	Serovar	Crystal type	Contributors and their culture Nos.	Remarks
161	5a5b, galleriae	gal	de Barjac	Petri plate contaminant of <i>Bacillus thuringiensis</i> culture, type M (mucoïd appearance) isolated in Brownsville, Tex.
162	3a3b, kurstaki	k-73	de Barjac	Petri plate contaminant of <i>Bacillus thuringiensis</i> culture, type T (typical appearance) isolated in Brownsville, Tex.
163	5a5b, galleriae	gal	de Barjac	Petri plate contaminant of <i>Bacillus thuringiensis</i> culture, type M (mucoïd appearance) isolated in Brownsville, Tex.
164	3a3b, kurstaki	k-1	de Barjac	Petri plate contaminant of <i>Bacillus thuringiensis</i> culture, type M (mucoïd appearance) isolated in Brownsville, Tex.
165	5a5b, galleriae	gal	de Barjac	Petri plate contaminant of <i>Bacillus thuringiensis</i> culture, type M (mucoïd appearance) isolated in Brownsville, Tex.
166	5a5b, galleriae	gal	de Barjac	Petri plate contaminant of <i>Bacillus thuringiensis</i> culture, type M (mucoïd appearance) isolated in Brownsville, Tex.
167	5a5b, galleriae	gal	de Barjac	Petri plate contaminant of <i>Bacillus thuringiensis</i> culture, type M (mucoïd appearance) isolated in Brownsville, Tex.
168	5a5b, galleriae	gal	de Barjac	Petri plate contaminant of <i>Bacillus thuringiensis</i> culture, type M (mucoïd appearance) isolated in Brownsville, Tex.
169	3a3b, kurstaki	k-1	de Barjac	Petri plate contaminant of <i>Bacillus thuringiensis</i> culture, type T (typical appearance) isolated in Brownsville, Tex.
170	5a5b, galleriae	gal	de Barjac	Petri plate contaminant of <i>Bacillus thuringiensis</i> culture, type M (mucoïd appearance) isolated in Brownsville, Tex.
171	3a3b, kurstaki	k-73	de Barjac	Petri plate contaminant of <i>Bacillus thuringiensis</i> culture, type T (typical appearance) isolated in Brownsville, Tex.
172	3a3b, kurstaki	k-1	de Barjac	Petri plate contaminant of <i>Bacillus thuringiensis</i> culture, type M (mucoïd appearance) isolated in Brownsville, Tex. Beautiful crystals.

"Crystal type" column: NI, not identified; NC, no crystals; AC, atypical crystal type.

BACILLUS THURINGIENSIS CULTURES MAINTAINED AT THE USDA LABORATORIES, BROWNSVILLE, TEX.

Duplicate culture No. (HD-)	Serovar	Crystal type	Contributors and their culture Nos.	Remarks
173	5a5b, galleriae	gal	de Barjac	Petri plate contaminant of Bacillus thuringiensis culture, type M (mucoïd appearance) isolated in Brownsville, Tex. Crystals appear atypical.
174	5a5b, galleriae	gal	de Barjac	Petri plate contaminant of Bacillus thuringiensis culture, type M (mucoïd appearance) isolated in Brownsville, Tex.
175	5a5b, galleriae	gal	de Barjac	Petri plate contaminant of Bacillus thuringiensis culture, type M (mucoïd appearance) isolated in Brownsville, Tex.
176	5a5b, galleriae	gal	de Barjac	Petri plate contaminant of Bacillus thuringiensis culture, type M (mucoïd appearance) isolated in Brownsville, Tex.
177	3a3b, kurstaki	k-73	de Barjac	Petri plate contaminant of Bacillus thuringiensis culture, type M (mucoïd appearance) isolated in Brownsville, Tex.
178	3a3b, kurstaki	k-73	de Barjac	Petri plate contaminant of Bacillus thuringiensis culture, type M (mucoïd appearance) isolated in Brownsville, Tex.
179	5a5b, galleriae	gal	de Barjac	Petri plate contaminant of Bacillus thuringiensis culture, type T (typical appearance) isolated in Brownsville, Tex.
180	3a3b, kurstaki	k-73	de Barjac	Petri plate contaminant of Bacillus thuringiensis culture, type T (typical appearance) isolated in Brownsville, Tex.
181	3a3b, kurstaki	k-73	de Barjac	Petri plate contaminant of Bacillus thuringiensis culture, type M (mucoïd appearance) isolated in Brownsville, Tex.
182	3a3b, kurstaki	k-73	de Barjac	Petri plate contaminant of Bacillus thuringiensis culture, type M (mucoïd appearance) isolated in Brownsville, Tex.
183	3a3b, kurstaki	k-73	de Barjac	Petri plate contaminant of Bacillus thuringiensis culture, type M (mucoïd appearance) isolated in Brownsville, Tex.
184	5a5b, galleriae	gal	de Barjac	Petri plate contaminant of Bacillus thuringiensis culture, type M (mucoïd appearance) isolated in Brownsville, Tex.

"Crystal type" column: NI, not identified; NC, no crystals; AC, atypical crystal type.

BACILLUS THURINGIENSIS CULTURES MAINTAINED AT THE USDA LABORATORIES, BROWNSVILLE, TEX.

Duplicate culture No. (HD-)	Serovar	Crystal type	Contributors and their culture Nos.	Remarks
185	5a5b, galleriae	gal	de Barjac	Petri plate contaminant of <i>Bacillus thuringiensis</i> culture, type M (mucoïd appearance) isolated in Brownsville, Tex.
186	5a5b, galleriae	gal	de Barjac	Petri plate contaminant of <i>Bacillus thuringiensis</i> culture, type M (mucoïd appearance) isolated in Brownsville, Tex.
187	3a3b, kurstaki	k-73	de Barjac	Petri plate contaminant of <i>Bacillus thuringiensis</i> culture, type M (mucoïd appearance) isolated in Brownsville, Tex.
188	5a5b, galleriae	aiz	de Barjac	Laboratory isolate derived from HD-8 at Brownsville, Tex.
189	5a5b, galleriae	gal	de Barjac	Laboratory isolate derived from HD-8 at Brownsville, Tex.
190	5a5b, galleriae	gal	de Barjac	Laboratory isolate derived from HD-8 at Brownsville, Tex.
191	3a3b, kurstaki	k-73	de Barjac	Laboratory isolate derived from HD-8 at Brownsville, Tex.
192	5a5b, galleriae	gal	de Barjac	Laboratory isolate derived from HD-8 at Brownsville, Tex.
193	5a5b, galleriae	gal	de Barjac	Laboratory isolate derived from HD-8 at Brownsville, Tex.
194	5a5b, galleriae	gal	de Barjac	Laboratory isolate derived from HD-8 at Brownsville, Tex.
195	5a5b, galleriae	gal	de Barjac	Laboratory isolate derived from HD-8 at Brownsville, Tex.
196	5a5b, galleriae	gal	de Barjac	Laboratory isolate derived from HD-8 at Brownsville, Tex.
197	5a5b, galleriae	gal	de Barjac	Laboratory isolate derived from HD-8 at Brownsville, Tex.
198	6, entomocidus	ent	Hunter	Isolated from <i>Cadra figulilella</i> .
199	10, darmstadensis	dar	Krieg 102	Double crystals.
200	10, darmstadensis	NI	Krieg B-30-1	
201	11a11b, toumanoffii	NI	Krieg B-30-2	Contributor received culture from O. Lysenko, Czechoslovakia. Culture is a single-cell isolate of
202	Not identified	NI	Fast 280-131	HD-280.

"Crystal type" column: NI, not identified; NC, no crystals; AC, atypical crystal type.

BACILLUS THURINGIENSIS CULTURES MAINTAINED AT THE USDA LABORATORIES, BROWNSVILLE, TEX.

Dulmage culture No. (HD-)	Serovar	Crystal type	Contributors and their culture Nos.	Remarks
203	3a3b, kurstaki	k-1	Dulmage HD-203	Isolated from diseased Heliothis virescens. Contributor received culture from O. Lysenko, Czechoslovakia. Culture is a single-cell isolate of HD-280.
204	Not identified	NI	Fast 280-132	
205	5a5b, galleriae	NI	de Barjac 2	Isolated by E. Reeves, U.S.A. Double crystals. Isolated from diseased Heliothis assulta. Isolated from diseased Ephestia cautella. Isolated from dust of sericulture farm. Contributor received culture from O. Lysenko, Czechoslovakia. Culture is a single-cell isolate of HD-280.
206	5a5b, galleriae	aiz	de Barjac 3	
207	5a5b, galleriae	gal	de Barjac 4	
208	5a5b, galleriae	gal	de Barjac 5	
209	5a5b, galleriae	gal	de Barjac 6	
210	5a5b, galleriae	aiz	de Barjac 7	
211	5a5b, galleriae	gal	de Barjac 9	
212	5a5b, galleriae	gal	de Barjac 11	
213	5a5b, galleriae	gal	de Barjac 12	
214	5a5b, galleriae	gal	de Barjac 13	
215	5a5b, galleriae	gal	de Barjac 15	
216	5a5b, galleriae	gal	de Barjac 16	
217	5a5b, galleriae	NI	de Barjac 19	
218	5a5b, galleriae	gal	de Barjac 22	
219	5a5b, galleriae	gal	de Barjac 24	
220	5a5b, galleriae	gal	de Barjac 25	
221	5a5b, galleriae	gal	de Barjac 26	
222	5a5b, galleriae	gal	de Barjac 27	
223	5a5b, galleriae	NI	de Barjac 28	
224	5a5b, not identified	NI	de Barjac	
225	5a5c, canadensis	k-1	Hall BA-068	
226	1, thuringiensis		Aizawa AF-101	
227	4a4b, dendrolimus		Aizawa HA-3	
228	7, aizawai		Aizawa IH-A	
229	7, aizawai		Aizawa T63L4	
230	Not identified	NI	Fast 280-141	
231	3a3b, kurstaki	k-1	de Barjac	Isolate derived from HD-187. Isolate derived from HD-187.
232	5a5b, galleriae	k-1	de Barjac	

"Crystal type" column: NI, not identified; NC, no crystals; AC, atypical crystal type.

BACILLUS THURINGIENSIS CULTURES MAINTAINED AT THE USDA LABORATORIES, BROWNSVILLE, TEX.

Duplicate culture No. (HD-)	Serovar	Crystal type	Contributors and their culture Nos.	Remarks
233	5a5b, galleriae	gal	de Barjac 3	New stock culture of HD-206.
234	5a5b, galleriae	aiz	de Barjac 7	New stock culture of HD-210.
235	5a5b, galleriae	gal	de Barjac B-1-1	Isolate derived from HD-187.
236	5a5b, galleriae	gal	de Barjac B-1-2	Isolate derived from HD-187.
237	5a5b, galleriae	gal	de Barjac B-2-1	Isolate derived from HD-187.
238	5a5b, galleriae	gal	de Barjac B-2-2	Isolate derived from HD-187.
239	5a5b, galleriae	gal	de Barjac D-2-1	Isolate derived from HD-187.
240	5a5b, galleriae	gal	de Barjac D-2-2	Isolate derived from HD-187.
241	3a3b, kurstaki	k-1	de Barjac D-3-1	Isolate derived from HD-187.
242	3a3b, kurstaki	k-1	de Barjac D-3-2	Isolate derived from HD-187.
243	3a3b, kurstaki	k-1	de Barjac D-3-3	Isolate derived from HD-187.
244	3a3b, kurstaki	k-1	de Barjac D-4-1	Isolate derived from HD-187.
245	3a3b, kurstaki	k-1	de Barjac D-4-2	Isolate derived from HD-187.
246	3a3b, kurstaki	k-1	de Barjac D-4-3	Isolate derived from HD-187.
247	3a3b, kurstaki	k-1	de Barjac D-4-4	Isolate derived from HD-187.
248	7, aizawai	aiz	Martinez	Isolated from Pectinophora gossypiella. Multiple crystals.
249	7, aizawai	aiz	Martinez	Isolated from Pectinophora gossypiella. Multiple crystals.
250	3a3b, kurstaki	k-1	Martinez	Airborne contaminant isolated from a plate culture of Bacillus thuringiensis.
251	3a3b, kurstaki	k-1	Martinez	Airborne contaminant isolated from a plate culture of Bacillus thuringiensis.
252	3a3b, kurstaki	k-1	Martinez	Airborne contaminant isolated from a plate culture of Bacillus thuringiensis.
253	Not identified	NI	Fast 280-142	Contributor received culture from O. Lysenko, Czechoslovakia. Culture is a single-cell isolate of HD-280.
254	3a3b, kurstaki	k-73	Martinez	Isolated from diseased Trichoplusia ni.
255	3a3b, kurstaki	k-1	Lewis and Lynch 1-ECB	Originally described as Bacillus thuringiensis var. kurstaki.
256	Autoagglutinates	k-1	Lewis and Lynch 2-ECB	Originally described as Bacillus thuringiensis var. kurstaki.
257	Autoagglutinates	k-1	Lewis and Lynch 3-ECB	Originally described as Bacillus thuringiensis var. kurstaki.
258	3a3b, kurstaki	k-1	Lewis and Lynch 4-ECB	Originally described as Bacillus thuringiensis var. kurstaki.

"Crystal type" column: NI, not identified; NC, no crystals; AC, atypical crystal type.

BACILLUS THURINGIENSIS CULTURES MAINTAINED AT THE USDA LABORATORIES, BROWNSVILLE, TEX.

Dulmage culture No. (HD-)	Serovar	Crystal type	Contributors and their culture Nos.	Remarks
259	3a3b, kurstaki	k-1	Lewis and Lynch 5-ECB	
260	1, thuringiensis	k-1	Martinez	Isolated from black parasitized Pectinophora gossypiella.
261	4a4c, kenya	k-1	Martinez	Isolated from diseased Pectinophora gossypiella.
262	3a3b, kurstaki	thu	Martinez	Isolated from diseased unparasitized Pectinophora gossypiella.
263	3a3b, kurstaki	k-1	Burges PIL-89	Isolated from pupa of Ephestia cautella by G. Ayerst, England (29.5.61-1).
264	1, thuringiensis	thu	Burges PIL-90	Isolated from "Bactan" spore preparation isolate B2 by G. Ayerst, England (29.5.61-1).
265	3a3b, kurstaki	k-1	Burges PIL-91	Isolated from Achroia grisella by G. Ayerst, England (19.6.61-1).
266	3a3b, kurstaki	thu	Burges PIL-92	Isolated from Ephestia cautella by G. Ayerst, England (19.6.61-2).
267	3a3b, kurstaki	k-1	Burges PIL-93	Isolated from Ephestia (Aphoma) qularis sp. by G. Ayerst, England (19.6.61-3).
268	4a4c, kenya	NI	Burges PIL-94	Isolated from Trichophaga tapetzelle by G. Ayerst, England (19.6.61-5).
269	3a3b, kurstaki	k-1	Burges PIL-95	Isolated from Ephestia elutella by G. Ayerst, England (19.6.61-6).
270	3a3b, kurstaki	k-1	Burges PIL-96	Isolated from Carpophilus hemipterus by G. Ayerst, England (30.6.61-2).
271	1, thuringiensis	thu	Burges PIL-99	Contributor received culture from G. Ayerst, England (1.11.61-1); originally in the collection of E. Steinhaus, U.S.A.
272	7, aizawai	NI	Burges PIL-105	Isolated from Plodia sp. by G. Ayerst, England (29.3.62-1).
273	5a5b, galleriae	gal	Burges PIL-106	Isolated by G. Ayerst, England (2.4.62-1).
274	7, aizawai	aiz	Burges PIL-122	Isolated from Nemopogon granella in an insectary by G. Ayerst, England (4.2.63-1).
275	Not identified	aiz	Burges PIL-126	Isolated from Plodia interpunctella in an insectary by G. Ayerst, England (6.6.63-1).
276	7, aizawai	ent	Burges PIL-128	Isolated from Plodia interpunctella in an insectary by G. Ayerst, England (6.6.63-3).

"Crystal type" column: NI, not identified; NC, no crystals; AC, atypical crystal type.

BACILLUS THURINGIENSIS CULTURES MAINTAINED AT THE USDA LABORATORIES, BROWNSVILLE, TEX.

Dulmage culture No. (HD-)	Serovar	Crystal type	Contributors and their culture Nos.	Remarks
277	4a4c, kenya	ken	Burges PIL-138	Isolated from larva of <i>Ephestia cautella</i> sent from Nairobi by M. Hyde; collection of G. Ayerst, England (30.8.63-1).
278	4a4c, kenya	ken	Burges PIL-139	Isolated from larva of <i>Ephestia cautella</i> sent from Nairobi by M. Hyde; collection of G. Ayerst, England (30.8.63-2).
279	3a3b, kurstaki	k-1	Burges PIL-158	Isolated from larva of <i>Ephestia cautella</i> in an insectary by G. Ayerst, England (26.3.64-1).
280	1, thuringiensis	thu k-1	Correa	Isolated from larva of diseased <i>Pectinophora gossypiella</i> .
281	1, thuringiensis	thu k-1	Correa	Isolated from diseased <i>Pectinophora gossypiella</i> from mass-rearing culture by U.S. Animal and Plant Health Inspection Service, San Benito, Tex.
282	7, aizawai	aiz	Correa	Isolated from diseased <i>Pectinophora gossypiella</i> from mass-rearing culture by U.S. Animal and Plant Health Inspection Service, San Benito, Tex.
283	7, aizawai	aiz	Burges PIL-127	Isolated from <i>Plodia interpunctella</i> in an insectary by G. Ayerst, England (6.6.63-2).
284	3a3b, kurstaki	k-73	Martinez	Spores rare. Granular cells and crystals present.
285	9, tolworthi	tol	Martinez	Airborne contaminant isolated from a plate culture of <i>Bacillus thuringiensis</i> .
286	3a3b, kurstaki	k-1	Martinez	Airborne contaminant isolated from a plate culture of <i>Bacillus thuringiensis</i> .
287	Not identified	k-1	Martinez	Airborne contaminant isolated from a plate culture of <i>Bacillus thuringiensis</i> .
288	1, thuringiensis	thu	Abul-Nasr	Airborne contaminant isolated from a plate culture of <i>Bacillus thuringiensis</i> .
289	1, thuringiensis	k-1 thu	Martinez	Airborne contaminant isolated from a plate culture of <i>Bacillus thuringiensis</i> .
290	1, thuringiensis	k-1 thu	Martinez	Airborne contaminant isolated from a plate culture of <i>Bacillus thuringiensis</i> .
291	4a4c, kenya	thu	Martinez	Isolated from diseased <i>Ephestia cautella</i> from orange pulp stored in Leesburg, Fla.
292	4a4c, kenya	NI	Allen 2	Isolated from diseased <i>Ephestia cautella</i> from orange pulp stored in Leesburg, Fla.
293	4a4c, kenya	ken	Allen 3	Isolated from diseased <i>Ephestia cautella</i> from orange pulp stored in Leesburg, Fla.

"Crystal type" column: NI, not identified; NC, no crystals; AC, atypical crystal type.

BACILLUS THURINGIENSIS CULTURES MAINTAINED AT THE USDA LABORATORIES, BROWNSVILLE, TEX.

Duplicate culture No. (HD-)	Serovar	Crystal type	Contributors and their culture Nos.	Remarks
294	4a4c, kenya	ken	Allen 9	Isolated from diseased Ephestia cautella from orange pulp stored in Leesburg, Fla.
295	4a4c, kenya	ken	Allen 10	Isolated from diseased Ephestia cautella from orange pulp stored in Leesburg, Fla.
296	4a4c, kenya	ken	Allen 11	Isolated from diseased Ephestia cautella from orange pulp stored at Leesburg, Fla.
297	1, thuringiensis	k-1 thu	Bucher 562-5A	Isolated from diseased Vitula edmandsae serratilineella.
298	Autoagglutinates	k-1 thu	Bucher 578-1A	Isolated from diseased Vitula edmandsae serratilineella.
299	3a3b, kurstaki	k-1	Burges HDB-26	Isolated from Anagasta kuehniella.
300	1, thuringiensis	NI	Burges HDB-27	Isolated from Cadra figulilella.
301	9, tolworthi	tol	Burges HDB-28	Isolated from Ephestia cautella.
302	3a3b, kurstaki	k-1	Burges HDB-30	Isolated from Galleria mellonella.
303	1, thuringiensis	thu	Burges HDB-32	Isolated from Galleria mellonella.
304	3a3b, kurstaki	NI	Burges HDB-33	Isolated from Galleria mellonella.
305	5a5b, galleriae	gal	Burges HDB-34	Isolated from Plodia interpunctella.
306	3a3b, kurstaki	k-1	Burges HDB-35	Isolated from Galleria mellonella.
307	1, thuringiensis	thu	Burges HDB-36	Isolated from Ephestia cautella.
308	1, thuringiensis	NI	Burges HDB-37	Isolated from Plodia interpunctella.
309	1, thuringiensis	k-1 thu	Burges HDB-38	Isolated from Plodia interpunctella.
310	3a3b, kurstaki	k-1	Burges HDB-39	Isolated from Galleria mellonella.
311	1, thuringiensis	NI	Arakawa KA-I	Isolated from Trogoderma simplex.
312	7, aizawai	NI	Arakawa KA-II	Isolated from Cadra figulilella.
313	3a3b, kurstaki	NI	Arakawa KA-III	Isolated from Pectinophora gossypiella.
314	7, aizawai	NI	Arakawa KA-IV	Isolated from Paramyelois transitella.
315	3a3b, kurstaki	NI	Arakawa KA-V	Isolated from Heliothis zea.
316	1, thuringiensis	k-1 thu	Martinez	Isolated from dead Pectinophora gossypiella.
317	1, thuringiensis	thu k-1	Martinez	Isolated from dead Pectinophora gossypiella.
318	1, thuringiensis	thu k-1	Martinez	Isolated from dead Pectinophora gossypiella.
319	1, thuringiensis	k-1 thu	Martinez	Isolated from dead Pectinophora gossypiella.

"Crystal type" column: NI, not identified; NC, no crystals; AC, atypical crystal type.

BACILLUS THURINGIENSIS CULTURES MAINTAINED AT THE USDA LABORATORIES, BROWNSVILLE, TEX.

Duplicate culture No. (HD-)	Serovar	Crystal type	Contributors and their culture Nos.	Remarks
320	6, entomocidus	ent	Krywienczyk	Contributor received culture from O. Lysenko, Czechoslovakia. Culture is a single-cell isolate of HD-316.
321	7, aizawai	NI	Gingrich AA-290	
322	5a5b, galleriae	gal	Gingrich AA-449	
323	Not identified	aiz	Gingrich AA-540	
324	8a8b, morrisoni	NI	Gingrich AA-559	
325	8a8b, morrisoni	NI	Gingrich AA-284B	
326	Not identified	thu	Gingrich AA-287	
327	Not identified	NI	Fast 316-11	
328	4a4c, kenya	ken	Gingrich AA-299	
329	Not identified	ale	Gingrich AA-340	
330	Not identified	ale	Gingrich AA-349	Isolated in Plot 17-1 (prespray). Isolated in Plot 19-tree 7. Isolated in Plot 24-2 (prespray). Isolated in Plot 8 (prespray). Isolated in Plot 17-1 (prespray). Isolated in Plot 20-4 (prespray). Isolated in Plot 27 (prespray). Isolated in Plot 8 (prespray). Isolated in Plot 9 (prespray). Isolated in Plot 22 (prespray). Isolated in Plot 5 (prespray). Isolated in Plot 15 (prespray). Isolated in Plot 12 (prespray). Isolated from a grasshopper. Isolated from 1st-instar grasshopper. Isolated in Plot 27 (prespray).
331	3a3b, kurstaki	k-73	Gingrich AA-402	
332	3a3b, kurstaki	k-1	Gingrich AA-412	
333	Not identified	NI	Gingrich AA-463	
334	Not identified	gal	Gingrich AA-470	
335	2, finitimus	NI	Gingrich AA-624	
336	3a3b, kurstaki	aiz	Gingrich AA-640	
337	3a3b, kurstaki	k-1	Thompson 2	
338	3a3b, kurstaki	k-1	Thompson 3	
339	3a3b, kurstaki	k-1	Thompson 4	
340	3a3b, kurstaki	k-1	Thompson 5	
341	3a3b, kurstaki	k-1	Thompson 6	
342	3a3b, kurstaki	k-1	Thompson 7	
343	3a3b, kurstaki	k-1	Thompson 8	
344	3a3b, kurstaki	k-73	Thompson 9	
345	3a3b, kurstaki	k-1	Thompson 10	
346	Not identified	k-1	Thompson 11	
347	3a3b, kurstaki	k-73	Thompson 12	
348	3a3b, kurstaki	NI	Thompson 13	
349	3a3b, kurstaki	NI	Thompson 14	
350	1, thuringiensis	thu	Henry BT I	
351	Not identified	thu	Henry BT II	
352	3a3b, kurstaki	k-1	Thompson 1	

"Crystal type" column: NI, not identified; NC, no crystals; AC, atypical crystal type.

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Duplicate culture No. (HD-)	Serovar	Crystal type	Contributors and their culture Nos.	Remarks
353	1, thuringiensis	NI	Martinez	Isolated from <i>Pectinophora gossypiella</i> larva.
354	1, thuringiensis	NI	Martinez	Isolated from <i>Pectinophora gossypiella</i> larva.
355	1, thuringiensis	NI	Martinez	Isolated from <i>Pectinophora gossypiella</i> larva.
356	Not identified	NI	Martinez	Isolated from <i>Pectinophora gossypiella</i> larva.
357	Not identified	thu	Gingrich AA-609	
358	10, darmstadtensis	NI	Beagle	
359	5a5b, galleriae	gal	Gingrich AA-653	
360	5a5b, galleriae	gal	Gingrich AA-678	
361	5a5b, galleriae	gal	Gingrich AA-681	
362	1, thuringiensis	k-1	Gingrich AA-285C	
363	Not identified	k-1 thu	Gingrich AA-284B	
364	1, thuringiensis	NI	Gingrich AA-691	
365	Not identified	NI	Shaikh 232 (783)	
366	Not identified	NI	Shaikh 233 (789)	
367	Not identified	NI	Shaikh 234 (794)	
368	Not identified	NI	Shaikh 235 (801)	
369	Not identified	NI	Shaikh 236 (803)	
370	Not identified	NI	Shaikh 254 (869)	
371	Not identified	NI	Shaikh 255 (870)	
372	Not identified	NI	Shaikh 256 (872)	
373	Not identified	NI	Shaikh 257 (873)	
374	Not identified	NI	Shaikh 258 (875)	
375	Not identified	NI	Shaikh 259 (877)	
376	Not identified	NI	Shaikh 260 (878)	
377	Not identified	NI	Shaikh 261 (879)	
378	Not identified	NI	Shaikh 262 (880)	
379	Not identified	NI	Shaikh 263 (881)	
380	Not identified	NI	Shaikh 264 (883)	
381	Not identified	NI	Shaikh 265 (884)	
382	Not identified	NI	Shaikh 266 (885)	
383	Not identified	NI	Shaikh 267 (886)	
384	Not identified	NI	Shaikh 268 (887)	
385	Not identified	NI	Shaikh 269 (888)	
386	Not identified	NI	Shaikh 270 (889)	

"Crystal type" column: NI, not identified; NC, no crystals; AC, atypical crystal type.

BACILLUS THURINGIENSIS CULTURES MAINTAINED AT THE USDA LABORATORIES, BROWNSVILLE, TEX.

Dulmage culture	Serovar	Crystal type	Contributors and their culture Nos.	Remarks
No. (HD-)				
387	Not identified	NI	Shaikh 271 (890)	
388	Not identified	NI	Shaikh 272 (892)	
389	Not identified	NI	Shaikh 273 (895)	
390	Not identified	NI	Shaikh 274 (896)	
391	Not identified	NI	Shaikh 275 (897)	
392	Not identified	NI	Shaikh 276 (898)	
393	Not identified	NI	Shaikh 277 (899)	
394	Not identified	NI	Shaikh 278 (900)	
395	13, pakistani	NI	Shaikh 232/14	
396	Not identified	NI	Shaikh 279 (902)	
397	Not identified	NI	Shaikh 280 (903)	
398	Not identified	NI	Shaikh 281 (904)	
399	Not identified	NI	Shaikh 282 (907)	
400	Not identified	NI	Shaikh (988)	
401	Not identified	NI	Shaikh 284 (922)	
402	Not identified	NI	Shaikh 285 (924)	
403	Not identified	NI	Shaikh 368 (1288)	
404	Not identified	NI	Shaikh 287 (926)	
405	Not identified	NI	Shaikh 288 (930)	
406	Not identified	NI	Shaikh 289 (931)	
407	Not identified	NI	Shaikh 290 (946)	
408	Not identified	NI	Shaikh 369 (1295)	
409	Not identified	NI	Shaikh 292 (952)	
410	Not identified	NI	Shaikh 293 (958)	
411	Not identified	NI	Shaikh 294 (981)	
412	Not identified	NI	Shaikh 295 (982)	
413	Not identified	NI	Shaikh 296 (984)	
414	Not identified	NI	Shaikh 297 (987)	
415	Not identified	NI	Shaikh 298 (989)	
416	Not identified	NI	Shaikh 299 (990)	
417	Not identified	NI	Shaikh 300 (997)	
418	Not identified	NI	Shaikh 301 (832)	
419	Not identified	NI	Shaikh 370 (1290)	
420	Not identified	NI	Shaikh 303 (835)	
421	Not identified	NI	Shaikh 304 (836)	

"Crystal type" column: NI, not identified; NC, no crystals; AC, atypical crystal type.

BACILLUS THURINGIENSIS CULTURES MAINTAINED AT THE USDA LABORATORIES, BROWNSVILLE, TEX.

Dulmage culture No. (HD-)	Serovar	Crystal type	Contributors and their culture Nos.	Remarks
422	Not identified	NI	Shaikh 305 (839)	
423	Not identified	NI	Shaikh 306 (866)	
424	Not identified	NI	Shaikh 307 (891)	
425	Not identified	NI	Shaikh 371 (1026)	
426	Not identified	NI	Shaikh 309 (909)	
427	Not identified	NI	Shaikh 310 (914)	
428	Not identified	NI	Shaikh 311 (916)	
429	Not identified	NI	Shaikh 312 (917)	
430	Not identified	NI	Shaikh 313 (918)	
431	Not identified	NI	Shaikh 314 (932)	
432	Not identified	NI	Shaikh 315 (933)	
433	4a4b, not identified	NI	Shaikh 454 (142)	Isolated from Bombyx mori.
434	4a4b, not identified	NI	Shaikh 464 (145)	Isolated from Bombyx mori.
435	Not identified	NI	Shaikh 316 (934)	
436	Not identified	NI	Shaikh 317 (935)	
437	Not identified	NI	Shaikh 456/2 (118)	
438	Not identified	NI	Shaikh 318 (936)	
439	Not identified	NI	Shaikh 372 (1080)	
440	Not identified	NI	Shaikh 320 (939)	
441	Not identified	NI	Shaikh 321 (941)	
442	Not identified	NI	Shaikh 322 (942)	
443	Not identified	NI	Shaikh 373 (1091)	
444	Not identified	NI	Shaikh 324 (964)	
445	Not identified	NI	Shaikh 325 (965)	
446	Not identified	NI	Shaikh 326 (972)	
447	4a4b, not identified	NI	Shaikh 327 (971)	
448	4a4b, not identified	NI	Shaikh 328 (973)	
449	Not identified	NI	Shaikh 329 (974)	
450	Not identified	NI	Shaikh 330 (978)	
451	Not identified	NI	Shaikh 331 (979)	
452	Not identified	NI	Shaikh 332 (1008)	
453	4a4b, not identified	NI	Lindegren	Isolated from Paramyelois transitella.
454	4a4c, not identified	NI		
455	Not identified	NI	Shaikh 333 (1028) Shaikh 334 (1030)	

"Crystal type" column: NI, not identified; NC, no crystals; AC, atypical crystal type.

BACILLUS THURINGIENSIS CULTURES MAINTAINED AT THE USDA LABORATORIES, BROWNSVILLE, TEX.

Duplicate culture No. (HD-)	Serovar	Crystal type	Contributors and their culture Nos.	Remarks
456	Not identified	NI	Shaikh 335 (1031)	
457	Not identified	NI	Shaikh 336 (1084)	
458	Not identified	NI	Shaikh 337 (1085)	
459	Not identified	NI	Shaikh 374 (1095)	
460	Not identified	NI	Shaikh 339 (1140)	
461	Not identified	NI	Shaikh 375 (1118)	
462	13, pakistani	NI	Shaikh 94	
463	Not identified	NI	Shaikh 376 (1119)	
464	Not identified	NI	Shaikh 342 (1156)	
465	Not identified	NI	Shaikh 343 (1211)	
466	Not identified	NI	Shaikh 344 (1212)	
467	Not identified	NI	Shaikh 345 (1213)	
468	Not identified	NI	Shaikh 346 (1215)	
469	Not identified	NI	Shaikh 347 (1219)	
470	4a4b, not identified	NI	Shaikh 119	
471	Not identified	NI	Shaikh 348 (1220)	
472	Not identified	NI	Shaikh 349 (1221)	
473	Not identified	NI	Shaikh 350 (1222)	
474	Not identified	NI	Shaikh 351 (1223)	
475	Not identified	NI	Shaikh 352 (1224)	
476	Not identified	NI	Shaikh 353 (1241)	
477	Not identified	NI	Shaikh 354 (1242)	
478	Not identified	NI	Shaikh 355 (1243)	
479	Not identified	NI	Shaikh 356 (1244)	
480	Not identified	NI	Shaikh 357 (1245)	
481	Not identified	NI	Shaikh 358 (1246)	
482	Not identified	NI	Shaikh 359 (1247)	
483	Not identified	NI	Shaikh 360 (1255)	
484	Not identified	NI	Shaikh 361 (1256)	
485	3a, alesti	NI	Yousten HL-1	Contributor received culture from H. Somerville, England.
486	3a, alesti	NI	Yousten HM-1	Contributor received culture from H. Somerville, England.
487	3a, alesti	NI	Yousten	Contributor received culture from H. Somerville, England.

"Crystal type" column: NI, not identified; NC, no crystals; AC, atypical crystal type.

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Dulmage culture No. (HD-)	Serovar	Crystal type	Contributors and their culture Nos.	Remarks
488	Not identified	NI	Yousten HD-181	Isolated from preparation R588B.
489	13, pakistani	NI	Bell	Isolated from Spodoptera litura on sweetpotato.
490	Not identified	NI	Shaikh 362 (1257)	
491	Not identified	NI	Shaikh 363 (1258)	
492	Not identified	NI	Shaikh 364 (1259)	
493	Not identified	NI	Shaikh 365 (1260)	
494	Not identified	NI	Shaikh 366 (1261)	
495	3a3b, kurstaki	NI	DeLuca S-77	
496	3a3b, kurstaki	NI	DeLuca B-15	
497	Not identified	NI	Shaikh 367 (1287)	
498	10, darmstadiensis	dar	DeLuca E-31	
499	10, darmstadiensis	dar	DeLuca E-31I	
500	14, israelensis	NI	Hall 60A	
501	8a8c, ostrinia	NI	Aizawa	Isolated in soil. Isolated in soil. Contributor received culture from L. Goldbergs, U.S.A. Contributor received culture from People's Republic of China.
502	1, thuringiensis	NI	Travers	Isolated from Culex pipiens 2d-instar larva.
503	Not identified	NI	Dean DBT-3	
504	Not identified	NI	Dean DBT-3 (t-104)	Isolate lysogenized with phage from HD-136.
505	Not identified	NI	Dean DBT-3 (t-202)	Isolate lysogenized with phage from HD-72.
506	Not identified	NI	Dean DBT-3 (t-217)	Isolate lysogenized with phage from HD-210.
507	Not identified	NI	Dean DBT-3 (t-227)	Isolate lysogenized with phage from HD-201.
508	Not identified	NI	Dean DBT-3 (t-231)	Isolate lysogenized with phage from HD-1.
509	Not identified	NI	Dean DBT-3 (t-391)	Isolate lysogenized with phage from HD-30.
510	Not identified	NI	Dean DBT-3 (t-456)	Isolate lysogenized with phage from HD-301.
511	16, dakota	NI	De Luca	Soil isolate from North Dakota barley field 69.
512	16, dakota	NI	DeLuca I-40	Soil isolate from North Dakota oat field.
513	Not identified	NI	Fast 316-12	Contributor received culture from O. Lysenko, Czechoslovakia. Culture is a single-cell isolate of HD-316.
514	Not identified	NI	Fast 316-13	Contributor received culture from O. Lysenko, Czechoslovakia. Culture is a single-cell isolate of HD-316.
515	Not identified	NI	Fast 316-14	Contributor received culture from O. Lysenko, Czechoslovakia. Culture is a single-cell isolate of HD-316.

"Crystal type" column: NI, not identified; NC, no crystals; AC, atypical crystal type.

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Dulmage culture No. (HD-)	Serovar	Crystal type	Contributors and their culture Nos.	Remarks
516	15, indiana	NI	DeLuca (4-85) (35II)	Soil isolate from soybean field in Vigo County, Indiana.
517	Not identified	NI	Stewart	Contributor received culture from A. Huddleston, U.S.A.
518	8a8b, morrisoni	NI	DeLuca	
519	15, indiana	NI	Correa	HD-500 pigmented isolate.
520	5a5b, gallerae	NI	Travers	Isolated from Culex pipiens 2d-instar larva.
521	15, indiana	NI	DeLuca	Soil isolate from soybean field in Vigo County, Indiana.
522	14, israelensis	NI	Goldberg OVR 60	
523	Not identified	NI	Fast 316-21	Contributor received culture from O. Lysenko, Czechoslovakia. Culture is a single-cell isolate of HD-316.
524	1, thuringiensis	NI	Aronson	Isolate received from Grain Products Co., U.S.A.
525	wuhanensis	NI	Luo & Chang	
526	2, finitimus	NI	de Barjac 2-2	Contributor received culture from A. Heimpel, U.S.A.
527	2, finitimus	NI	de Barjac 2-3	Contributor received culture from P. Massenet, France.
528	2, finitimus	NI	de Barjac 2-6	Contributor received culture from L. Bulla, U.S.A.
529	2, finitimus	NI	de Barjac 2-7	Contributor received culture from S. Abul-Nasr, Egypt.
530	8a8b, morrisoni	NI	de Barjac 8-1	Contributor received culture from J. Norris, England.
531	8a8b, morrisoni	NI	de Barjac 8-2	Contributor received culture from J. Norris, England.
532	8a8b, morrisoni	NI	de Barjac 8-3	Contributor received culture from A. Heimpel, U.S.A.
533	8a8b, morrisoni	NI	de Barjac 8-5	Contributor received culture from M. Meynadier, France.
534	8a8b, morrisoni	NI	de Barjac 8-6	Contributor received culture from J. Vankova, Czechoslovakia.
535	8a8b, morrisoni	NI	de Barjac 8-7	Contributor received culture from J. Vankova, Czechoslovakia.
536	8a8c, ostriniae	NI	de Barjac 80-1	Contributor received culture from Ren Gai-Xin, People's Republic of China.
537	9, tolworthi	NI	de Barjac 9-4	Contributor received culture from C. Thompson, U.S.A.
538	9, tolworthi	NI	de Barjac 9-5	Contributor received culture from C. Charmoille, France.
539	10, darmstadtensis	NI	de Barjac 10-7	Contributor received culture from E. Afrikian, U.S.S.R.
540	11a11b, toumanoffii	NI	de Barjac 11-1	Contributor received culture from A. Krieg, Germany.
541	11a11c, kyushuensis	NI	de Barjac 110-1	Contributor received culture from M. Ohba, Japan.
542	12, thompsoni	NI	de Barjac 12-1	Contributor received culture from C. Thompson, U.S.A.

"Crystal type" column: NI, not identified; NC, no crystals; AC, atypical crystal type.

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Dulmage culture No. (HD-)	Serovar	Crystal type	Contributors and their culture Nos.	Remarks
543	12, thompsoni	NI	de Barjac 12-2	Contributor received culture from C. Thompson, U.S.A.
544	3a3b, kurstaki	NI	de Barjac 30-136	Contributor received culture from C. Sidor, Yugoslavia.
545	3a3b, kurstaki	k-1	de Barjac 30-138	Contributor received culture from K. Khan, Pakistan.
546	3a3b, kurstaki	NI	de Barjac 30-140	Contributor received culture from M. Habib, Brazil.
547	4a4b, dendrolimus	NI	de Barjac 40-13	Contributor received culture from M. Goukassian, U.S.S.R.
548	4a4b, dendrolimus	den	de Barjac 40-31	Contributor received culture from Biochem, U.S.S.R.
549	4a4c, kenya	NI	de Barjac 400-9	Contributor received culture from S. Amonkar, India.
550	4a4c, kenya	NI	de Barjac 400-11	Contributor received culture from S. Amonkar, India.
551	4a4c, kenya	NI	de Barjac 400-12	Contributor received culture from I. Kuzmanova, Bulgaria.
552	5a5c, canadensis	NI	de Barjac 50-1	Contributor received culture from O. Morris, Canada.
553	5a5c, canadensis	NI	de Barjac 50-3	Contributor received culture from M. Jacquemard, Chad.
554	5a5c, canadensis	NI	de Barjac 50-4	Contributor received culture from M. Jacquemard, Chad.
555	4a4c, kenya	NI	de Barjac 400-10	Contributor received culture from S. Amonkar, India.
556	1, thuringiensis	k-1	Tsai & Sha 007	
557	4a4b, dendrolimus	NI	Tsai & Sha 7417	
558	5a5b, galleriae	NI	Tsai & Sha 010	
559	8a8b, morrisoni	NI	Tsai & Sha 006	
560	4a4c, kenya	NI	Tsai & Sha 7304	
561	1, thuringiensis	NI	Aronson	Culture isolated from Parasporine grain process, U.S.A.
562	3a3b, kurstaki	NI	Aronson	Culture isolated from paste of freeze-dried spores of HD-500.
563	14, israelensis	NI	Aronson R-153-78	Contributor received culture from Pasteur Institut, Paris.
564	3a3b, kurstaki	NI	Aronson	Isolated from freeze-dried spores of HD-1.
565	5a5c, canadensis	NI	Thompson 1	Isolated from dead budworm larva, Taos, N. Mex., U.S.A.
566	Not identified	NI	Fast 316-22	Contributor received culture from O. Lysenko, Czechoslovakia. Culture is a single-cell isolate of HD-316.
567	14, israelensis	isr	de Barjac -	
568	4a4b, dendrolimus	NI	de Barjac Sid 1.1, No. 40.30	
569	Not identified	NI	Fast 316-31	Contributor received culture from O. Lysenko, Czechoslovakia. Culture is a single-cell isolate of HD-316.

"Crystal type" column: NI, not identified; NC, no crystals; AC, atypical crystal type.

BACILLUS THURINGIENSIS CULTURES MAINTAINED AT THE USDA LABORATORIES, BROWNSVILLE, TEX.

Dulmage culture No. (HD-)	Serovar	Crystal type	Contributors and their culture Nos.	Remarks
570	Not identified	NI	Fast 316-32	Contributor received culture from O. Lysenko, Czechoslovakia. Culture is a single-cell isolate of HD-316.
571	11a11c, kyushuensis	NI	Aizawa	Contributor received culture from People's Republic of China.
572	wuhanensis	gal	Aizawa	
573	wuhanensis	NI	Burges 140	
574	1, thuringiensis	NI	Burges 007	Contributor received culture from N. Hussey, England.
575	4a4b, dendrolimus	den	Burges 7417	Contributor received culture from N. Hussey, England.
576	5a5b, gallieriae	NI	Burges 010	Culture isolated in the People's Republic of China.
577	8a8c, ostrinae	NI	Burges 006	Contributor received culture from N. Hussey, England.
578	4a4c, kenya	NI	Burges 7304	Culture isolated in the People's Republic of China.
579	8a8b, morrisoni	NI	Weiser 4	Isolated from silkworm farm, Japan.
580	8a8b, morrisoni	NI	Weiser 15	
581	1, thuringiensis	NI	Weiser 1	
582	Not identified	NI	Weiser 13	
583	1, thuringiensis	NI	Weiser 058	
584	4a4b, dendrolimus	NI	Aizawa AO-1	
585	4a4b, dendrolimus	NI	Aizawa AO-2	
586	4a4b, dendrolimus	NI	Aizawa AO-15	
587	4a4c, kenya	NI	Aizawa AO-159	
588	4a4c, kenya	NI	Aizawa 74-E-83-8	
589	4a4c, kenya	NI	Aizawa 74-E-86-1	
590	4a4c, kenya	NI	Aizawa 74-E-86-3	
591	4a4c, kenya	NI	Aizawa 74-E-86-24	
592	5a5c, canadensis	NI	Aizawa 74-E-74-7	
593	7, aizawai	NI	Aizawa AO-7	
594	7, aizawai	NI	Aizawa AO-40	
595	7, aizawai	NI	Aizawa AO-97	

"Crystal type" column: NI, not identified; NC, no crystals; AC, atypical crystal type.

BACILLUS THURINGIENSIS CULTURES MAINTAINED AT THE USDA LABORATORIES, BROWNSVILLE, TEX.

Dulmage culture No. (HD-)	Serovar	Crystal type	Contributors and their culture Nos.	Remarks
596	7, aizawai	NI	Aizawa 74-E-20-1	Isolated from silkworm farm, Japan.
597	8a8b, morrisoni	NI	Aizawa AO-9	Isolated from silkworm farm, Japan.
598	8a8b, morrisoni	NI	Aizawa AO-19	Isolated from silkworm farm, Japan.
599	8a8b, morrisoni	NI	Aizawa AO-46	Isolated from silkworm farm, Japan.
600	8a8b, morrisoni	NI	Aizawa AO-75	Isolated from silkworm farm, Japan.
601	10, darmstadiensis	dar	Aizawa 74-E-82-1	Isolated from silkworm farm, Japan.
602	10, darmstadiensis	NI	Aizawa 74-E-82-6	Isolated from silkworm farm, Japan.
603	10, darmstadiensis	dar	Aizawa 74-E-82-13	Isolated from silkworm farm, Japan.
604	10, darmstadiensis	dar	Aizawa 74-E-81-19	Isolated from silkworm farm, Japan.
605	7, aizawai	NI	Aizawa 79-F-29-22	Isolated from silkworm farm, Japan.
606	7, aizawai	NI	Aizawa 79-F-23-4	Isolated from silkworm farm, Japan.
607	4a4b, not identified	NI	Aizawa 74-E-65-4	Isolated from silkworm farm, Japan.
608	4a4b, not identified	NI	Aizawa 79-F-23-2	Isolated from silkworm farm, Japan.
609	10, darmstadiensis	dar	Aizawa 74-E-81-10	Isolated from silkworm farm, Japan.
610	4a4b, not identified	NI	Aizawa 74-E-93-2	Isolated from silkworm farm, Japan.
611	8a8b, morrisoni	NI	Aizawa 63B-2E-18	Isolated from silkworm farm, Japan.
612	10, darmstadiensis	dar	Aizawa 74-E-82-19	Isolated from silkworm farm, Japan.
613	4a4b, not identified	NI	Aizawa AO-70	Isolated from silkworm farm, Japan.
614	4a4b, not identified	NI	Aizawa AO-94	Isolated from silkworm farm, Japan.
615	8a8b, morrisoni	NI	Aizawa 74-E-86-93	Isolated from silkworm farm, Japan.
616	4a4c, kenyae	NI	Aizawa 78-FS-52-6	Isolated from silkworm farm, Japan.
617	4a4c, kenyae	NI	Aizawa 78-FS-52-1	Isolated from silkworm farm, Japan.
618	4a4c, kenyae	NI	Aizawa 78-FS-32-3	Isolated from silkworm farm, Japan.
619	4a4c, kenyae	NI	Aizawa 79-F-26-1	Isolated from silkworm farm, Japan.
620	4a4c, kenyae	NI	Aizawa 79-F-29-9	Isolated from silkworm farm, Japan.
621	8a8b, morrisoni	k-1	Aizawa 73-A-30-3	Isolated from silkworm farm, Japan.
622	8a8b, morrisoni	NI	Aizawa 73-A-24-2	Isolated from silkworm farm, Japan.
623	8a8b, morrisoni	NI	Aizawa AO-120	Isolated from silkworm farm, Japan.
624	8a8b, morrisoni	NI	Aizawa AO-91	Isolated from silkworm farm, Japan.
625	10, darmstadiensis	NI	Aizawa 74-E-80-13	Isolated from silkworm farm, Japan.
626	10, darmstadiensis	NI	Aizawa 74-E-80-7	Isolated from silkworm farm, Japan.
627	10, darmstadiensis	NI	Aizawa 74-E-80-2	Isolated from silkworm farm, Japan.
628	10, darmstadiensis	NI	Aizawa 74-E-81-3	Isolated from silkworm farm, Japan.
629	7, aizawai	NI	Aizawa 79-F-5-18	Isolated from silkworm farm, Japan.
630	7, aizawai	NI	Aizawa 74-E-71-3	Isolated from silkworm farm, Japan.

"Crystal type" column: NI, not identified; NC, no crystals; AC, atypical crystal type.

BACILLUS THURINGIENSIS CULTURES MAINTAINED AT THE USDA LABORATORIES, BROWNSVILLE, TEX.

Dulmage culture No. (HD-)	Serovar	Crystal type	Contributors and their culture Nos.	Remarks
631	4a1b, not identified	NI	Aizawa A0-68	Isolated from silkworm farm, Japan.
632	7, aizawai	NI	Aizawa 74-E-18-11	Isolated from silkworm farm, Japan.
633	4a1b, not identified	NI	Aizawa A0-90	Isolated from silkworm farm, Japan.
634	4a1b, not identified	NI	Aizawa 79-F-39-1	Isolated from silkworm farm, Japan.
635	6, entomocidus	ent	Foda	
636	Not identified	NI	Carlton derivative 1	
637	Not identified	NI	Carlton derivative 2	
638	Not identified	NI	Carlton derivative 3	
639	Not identified	NI	Carlton derivative 4	
640	Not identified	NI	Carlton derivative 5	
641	Not identified	NI	Carlton derivative 6	
642	Not identified	NI	Carlton derivative 7	
643	Not identified	NI	Carlton derivative 8	
644	Not identified	NI	Carlton derivative 9	
645	Not identified	NI	Carlton derivative 10	
646	Not identified	NI	Carlton derivative 11	
647	Not identified	NI	Carlton derivative 12	
648	14, israelensis	NI	Couch 795/II 1	Originally isolated in Nigeria.
649	14, israelensis	NI	Couch 795/II 2	Originally isolated in Nigeria.
650	5a5b, galleriae	NI	Weiser 37	Originally isolated in Nigeria.
651	5a5b, galleriae	NI	Weiser 73	Originally isolated in Nigeria.
652	8a8b, morrisoni	NI	Weiser 82	Originally isolated in Nigeria.
653	14, israelensis	isr	Singer 2013-1	Originally isolated in Romania.
654	14, israelensis	thu		
		isr	Singer 2013-2	Originally isolated in Romania.
		thu		
655	14, israelensis	ale		
		isr	Singer 2013-5	Originally isolated in Romania.
		thu		
		ale		
656	14, israelensis	isr	Singer 2013-7	Originally isolated in Romania.
		thu		
		ale		
657	14, israelensis	isr	Singer 2013-9	Originally isolated in Romania.
658	14, israelensis	isr	Singer 2013-10	Originally isolated in Romania.

"Crystal type" column: NI, not identified; NC, no crystals; AC, atypical crystal type.

BACILLUS THURINGIENSIS CULTURES MAINTAINED AT THE USDA LABORATORIES, BROWNSVILLE, TEX.

Dulmage culture No. (HD-)	Serovar	Crystal type	Contributors and their culture Nos.	Remarks
659	14, israelensis	isr thu ale	Singer 2013-11	Originally isolated in Romania.
660	Not identified	NI	Fast 316-41	Contributor received culture from O. Lysenko, Czechoslovakia. Culture is a single-cell isolate of HD-316.
661	14, israelensis	NI	Singer	
662	4a4b, not identified	NI	Khan 177	
663	4a4b, not identified	NI	Khan 180	
664	1, thuringiensis	NI	Khan 181	
665	8a8b, morrisoni	NI	Khan 185	
666	4a4b, not identified	NI	Khan 191	
667	4a4b, not identified	NI	Khan 193	
668	4a4b, not identified	NI	Khan 195	
669	4a4b, not identified	NI	Khan 201	
670	4a4b, not identified	NI	Khan 202	
671	4a4b, not identified	NI	Khan 204	
672	4a4b, not identified	NI	Khan 212	
673	4a4b, not identified	NI	Khan 213	
674	4a4b, not identified	NI	Khan 215	
675	4a4b, not identified	NI	Khan 216	
676	4a4b, not identified	NI	Khan 217	
677	4a4b, not identified	NI	Khan 220	
678	4a4b, not identified	NI	Khan 221	
679	4a4b, not identified	NI	Khan 229	
680	5a5b, galleriae	NI	Khan 230	
681	2, finitimus	NI	Khan 231	
682	2, finitimus	NI	Khan 809	
683	5a5b, galleriae	NI	Khan 812	
684	4a4b, not identified	NI	Khan 814	
685	4a4b, not identified	NI	Khan 819	
686	4a4b, not identified	NI	Khan 822	
687	4a4b, not identified	NI	Khan 825	
688	Not identified	NI	Khan 847	
689	Not identified	NI	Khan 850	

"Crystal type" column: NI, not identified; NC, no crystals; AC, atypical crystal type.

BACILLUS THURINGIENSIS CULTURES MAINTAINED AT THE USDA LABORATORIES, BROWNSVILLE, TEX.

Dulmage culture No. (HD-)	Serovar	Crystal type	Contributors and their culture Nos.	Remarks
690	Not identified	NI	Khan 851	Contributor received culture from O. Lysenko, Czechoslovakia. Culture is a single-cell isolate of HD-317.
691	Not identified	NI	Khan 867	
692	Not identified	NI	Khan 868	
693	4a4b, sotto	NI	Faust	
694	3a3b, kurstaki	NI	Faust	
695	1, thuringiensis	thu	Fast 317-1	Contributor received culture from O. Lysenko, Czechoslovakia. Culture is a single-cell isolate of HD-280.
696	1, thuringiensis	thu k-1	Fast 280-1-2	
697	1, thuringiensis	thu	Fast 318-2-1	
698	1, thuringiensis	thu k-1	Fast 318-2-2	
699	1, thuringiensis	thu k-1	Fast 316-3	
700	1, thuringiensis	thu k-1	Fast 319-2	Contributor received culture from O. Lysenko, Czechoslovakia. Culture is a single-cell isolate of HD-316.
701	1, thuringiensis	thu k-1	Fast 280-1	
702	1, thuringiensis	thu k-1	Fast 316-1	
703	1, thuringiensis	thu k-1	Fast 319-1	
704	1, thuringiensis	thu k-1	Fast 280-1-1	

"Crystal type" column: NI, not identified; NC, no crystals; AC, atypical crystal type.

BACILLUS THURINGIENSIS CULTURES MAINTAINED AT THE USDA LABORATORIES, BROWNSVILLE, TEX.

Dulmage culture No. (HD-)	Serovar	Crystal type	Contributors and their culture Nos.	Remarks
705	1, thuringiensis	thu k-1	Fast 317-2	Contributor received culture from O. Lysenko, Czechoslovakia. Culture is a single-cell isolate of HD-317.
706	1, thuringiensis	thu k-1	Fast 316-2	Contributor received culture from O. Lysenko, Czechoslovakia. Culture is a single-cell isolate of HD-316.
707	1, thuringiensis	thu k-1	Fast 318-1	Contributor received culture from O. Lysenko, Czechoslovakia. Culture is a single-cell isolate of HD-318.
708	1, thuringiensis	thu k-1	Fast 316-4	Contributor received culture from O. Lysenko, Czechoslovakia. Culture is a single-cell isolate of HD-316.
709	3a3b, kurstaki	NI	Rao	Contributor received culture from Wuhan Production Plant, Wuhan, People's Republic of China.
710	5a5b, galleriae	NI	Yendol	Contributor received culture from Wuhan Production Plant, Wuhan, People's Republic of China.
711	5a5b, galleriae	NI	Yendol	Contributor received culture from Wuhan Production Plant, Wuhan, People's Republic of China.
712	5a5b, galleriae	NI	Yendol	Contributor received culture from Wuhan Production Plant, Wuhan, People's Republic of China.
713	5a5b, galleriae	NI	Yendol	Isolated from dried Bacillus thuringiensis material.
714	Not identified	NI	Yendol	Isolated from dried Bacillus thuringiensis material.
715	Not identified	NI	Yendol	Isolated from dried Bacillus thuringiensis material.
716	Not identified	NI	Yendol	Isolated from dried Bacillus thuringiensis material.
717	Not identified	NI	Stewart 196-A	Isolated from Pectinophora gossypiella.
718	Not identified	NI	Stewart 197-A	Isolated from Pectinophora gossypiella.
719	Not identified	NI	Stewart 197-B	Isolated from Pectinophora gossypiella.
720	Not identified	NI	Stewart 197-C	Isolated from Pectinophora gossypiella.
721	3a3b, kurstaki	NI	Thompson 1-27	Isolated from dead pupae of Choristomeura occidentalis.
722	3a3b, kurstaki	NI	Thompson 1-29	Isolated from dead pupae of Choristomeura occidentalis.
723	3a3b, kurstaki	NI	Thompson 7-15	Isolated from dead pupae of Choristomeura occidentalis.
724	1, thuringiensis	NI	Carlton derivative 13	
725	Not identified	NI	Carlton derivative 14	
726	Not identified	NI	Carlton derivative 15	
727	1, thuringiensis	NI	Carlton derivative 16	
728	Not identified	NI	Carlton derivative 17	

"Crystal type" column: NI, not identified; NC, no crystals; AC, atypical crystal type.

BACILLUS THURINGIENSIS CULTURES MAINTAINED AT THE USDA LABORATORIES, BROWNSVILLE, TEX.

Dulmage culture No. (HD-)	Serovar	Crystal type	Contributors and their culture Nos.	Remarks
729	Not identified	NI	Carlton derivative 18	Contributor received culture from O. Lysenko, Czechoslovakia. Culture is a single-cell isolate of HD-316.
730	Not identified	NI	Carlton derivative 19	
731	Not identified	NI	Carlton derivative 20	
732	Not identified	NI	Carlton derivative 21	
733	Not identified	NI	Carlton derivative 22	
734	Not identified	NI	Fast 316-42	Contributor received culture from O. Lysenko, Czechoslovakia. Culture is a single-cell isolate of HD-316. Isolated from Ephestia kuehniella. Isolated from Plodia interpunctella. Isolated from larva of moth.
735	Not identified	NI	Russo ATCC 10792	
736	Not identified	NI	Russo ATCC 13366	
737	Not identified	NI	Russo ATCC 13367	
738	1, thuringiensis	NI	Carlton derivative 23	
739	Not identified	NI	Carlton derivative 24	Contributor received culture from O. Lysenko, Czechoslovakia. Culture is a single-cell isolate of HD-316. Contributor received culture from O. Lysenko, Czechoslovakia. Culture is a single-cell isolate of HD-316.
740	Not identified	NI	Carlton derivative 25	
741	1, thuringiensis	NI	Carlton derivative 26	
742	Not identified	NI	Carlton derivative 27	
743	4a4c, kenya	NI	Vail	
744	Not identified	NI	Fast 316-43	Contributor received culture from O. Lysenko, Czechoslovakia. Culture is a single-cell isolate of HD-316. Contributor received culture from O. Lysenko, Czechoslovakia. Culture is a single-cell isolate of HD-316.
745	Not identified	NI	Fast 316-44	
746	Not identified	NI	Carlton derivative 28	
747	1, thuringiensis	NI	Carlton derivative 29	
748	1, thuringiensis	NI	Carlton derivative 30	
749	1, thuringiensis	NI	Fast 316-4	Contributor received culture from O. Lysenko, Czechoslovakia. Culture is a single-cell isolate of HD-316. Contributor received culture from O. Lysenko, Czechoslovakia. Culture is a single-cell isolate of HD-316. Contributor received culture from O. Lysenko, Czechoslovakia. Culture is a single-cell isolate of HD-317.
750	Not identified	NI	Fast 317-1	
751	1, thuringiensis	NI	Fast 317-2	

"Crystal type" column: NI, not identified; NC, no crystals; AC, atypical crystal type.

BACILLUS THURINGIENSIS CULTURES MAINTAINED AT THE USDA LABORATORIES, BROWNSVILLE, TEX.

Dulmage culture No. (HD-)	Serovar	Crystal type	Contributors and their culture Nos.	Remarks
752	1, thuringiensis	NI	Fast 318-1	Contributor received culture from O. Lysenko, Czechoslovakia. Culture is a single-cell isolate of HD-318.
753	10, darmstadiensis	NI	Aizawa 73-E-10-2	Mutant of HD-500. Mutant of HD-500. Isolated from Heliothis punctigera in lab culture.
754	10, darmstadiensis	NI	Aizawa 73-E-10-16	
755	10, darmstadiensis	NI	Aizawa 74-E-37-14	
756	14, darmstadiensis	NI	Dean 4Q2A	
757	14, israelensis	NI	Dean 4Q2B	Contributor received culture from J. Norris, England.
758	4a4c, kenya	NI	Teakle G52	
759	4a4b, not identified	NI	Fast 151	
760	4a4b, not identified	NI	Fast	
761	4a4b, not identified	NI	Fast	Contributor received culture from J. Norris, England.
762	4a4b, not identified	NI	Fast	
763	Not identified	NI	Fast	
764	Not identified	NI	Carlton derivative 31	
765	Not identified	NI	Carlton derivative 32	
766	Not identified	NI	Carlton derivative 33	
			Carlton derivative 34	

"Crystal type" column: NI, not identified; NC, no crystals; AC, atypical crystal type.

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